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G08B 7/06

(52) UK CL (Edition O )

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U1S S1820 S2196 S2215

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EP 0265064 A2 WO 94/18760 A1 WO 90/09082 A1

WO 88/05247 A1 US 4419668 A

(58) Field of Search

UK CL (Edition O ) G4H HRCU

INT CL<sup>6</sup> G08B

## (54) Radio receiver

(57) A selective calling receiver includes a decoder 7 which detects whether a code included in a received message accompanying its own selective calling (subscriber) number is the same as any of a number of predetermined cod-stored in a table 5. If so, it displays 13 a corresponding predetermined message and notifies it in a corresponding way, both specified by the table (the contents of which can be modified by the user using switches 6 and display 13). The notification may selectively be by LED 123, vibrator 122, or loudspeaker 121, and if by loudspeaker may be a ringing tone generated by a driver 8 or may be a melody generated by a melody circuit 9.

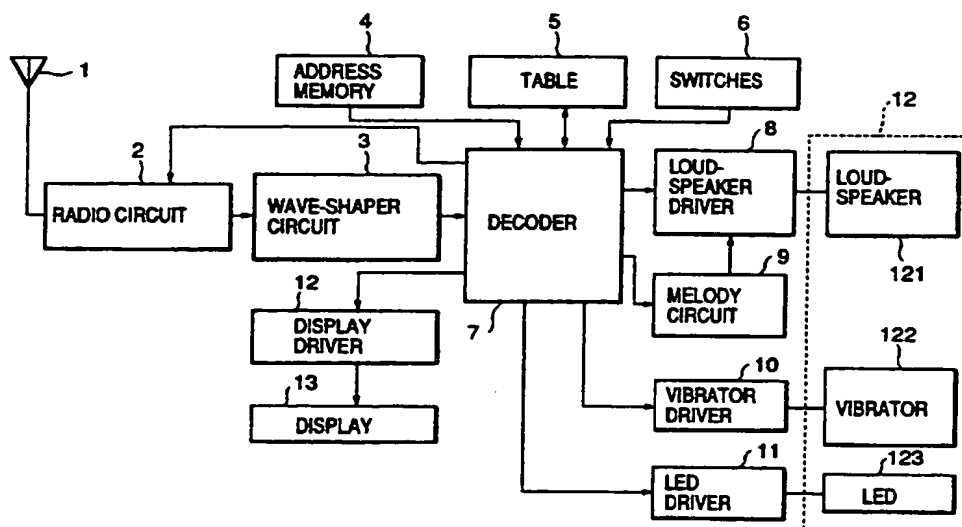


FIG.1

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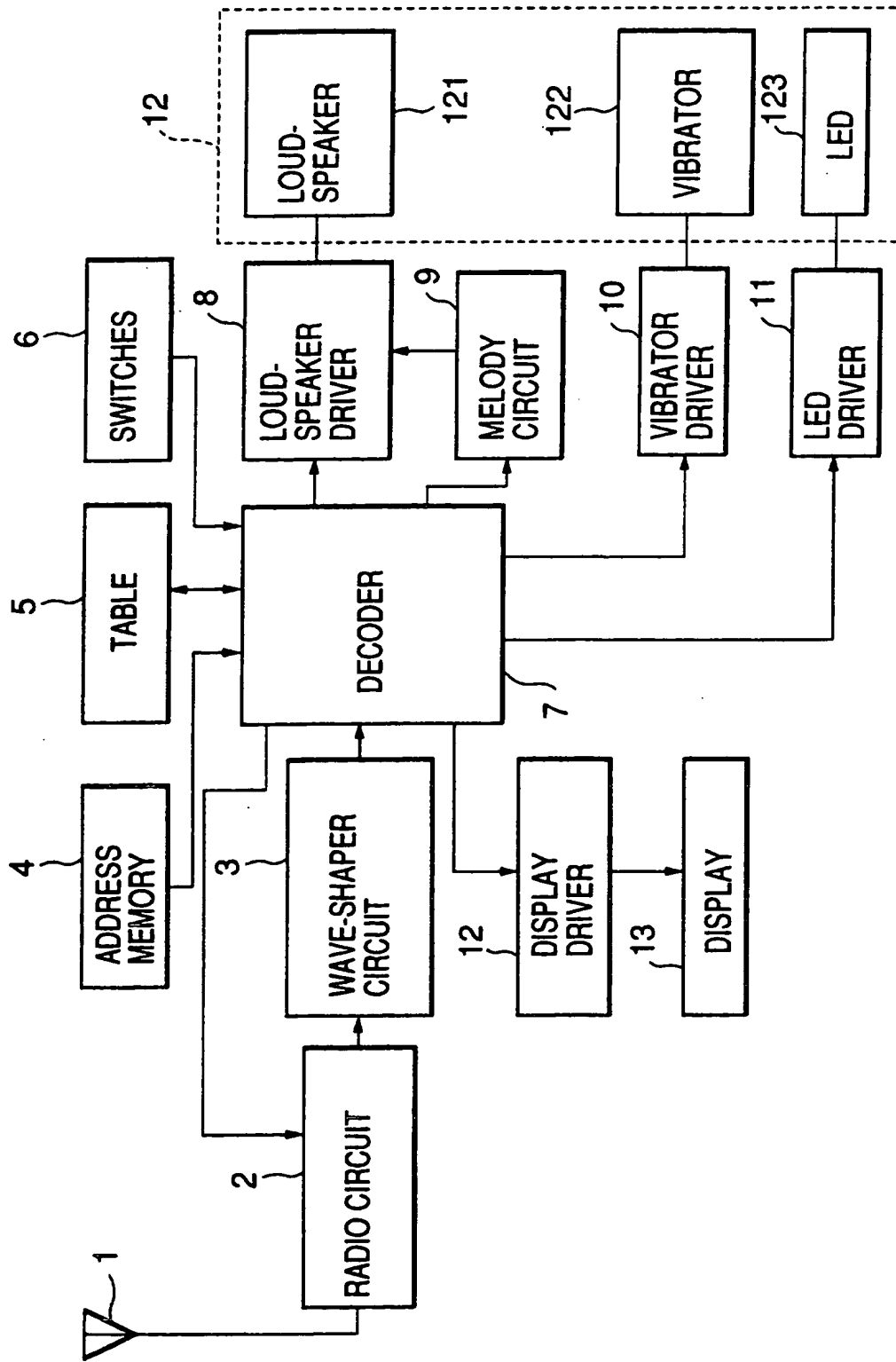


FIG.1

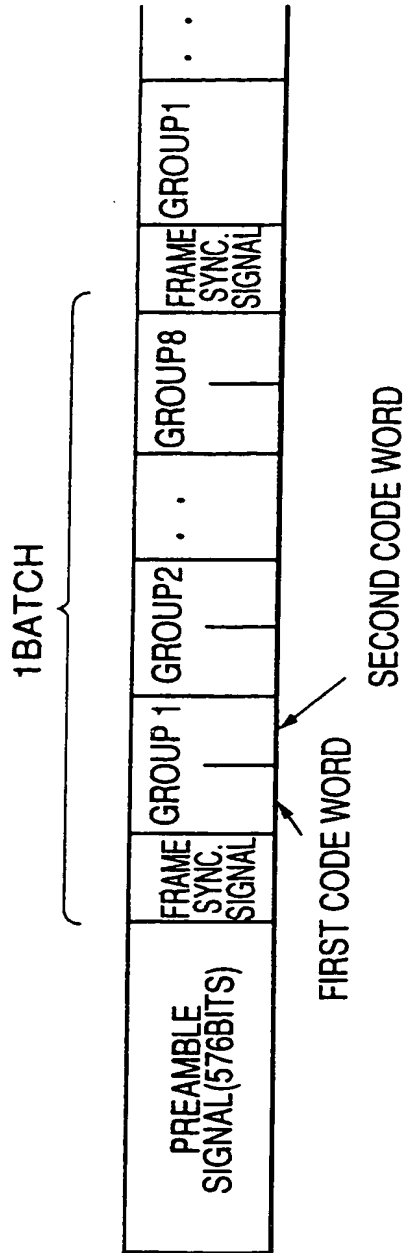


FIG. 2(a)

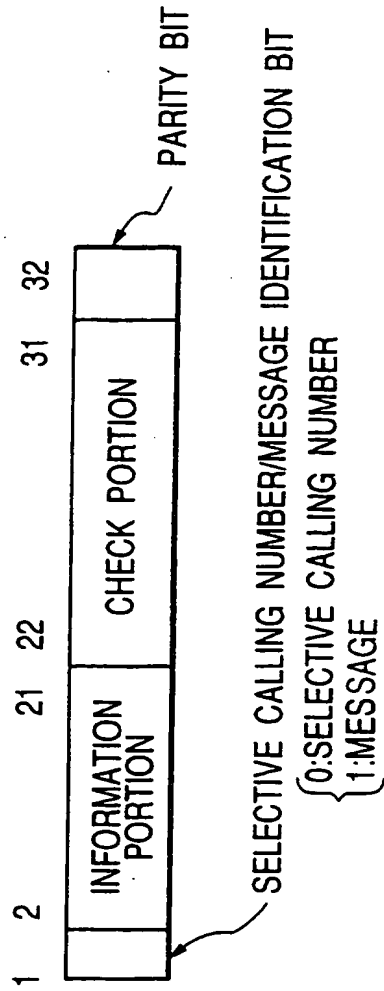


FIG. 2(b)

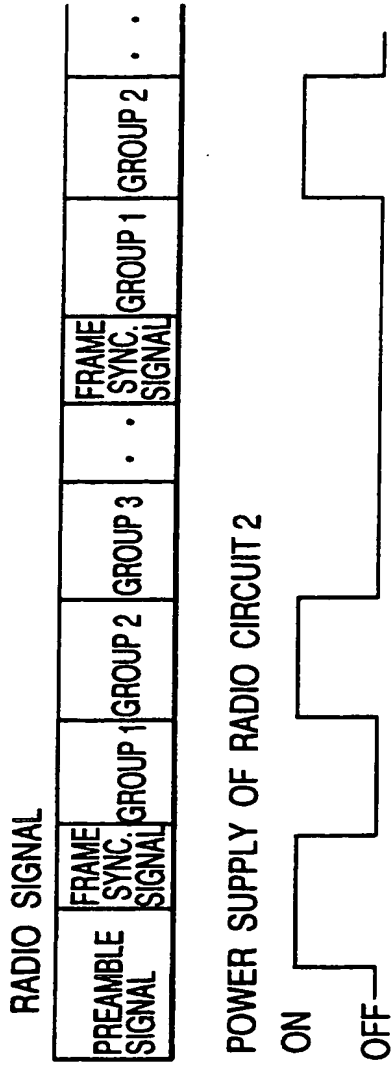


FIG. 3(a)

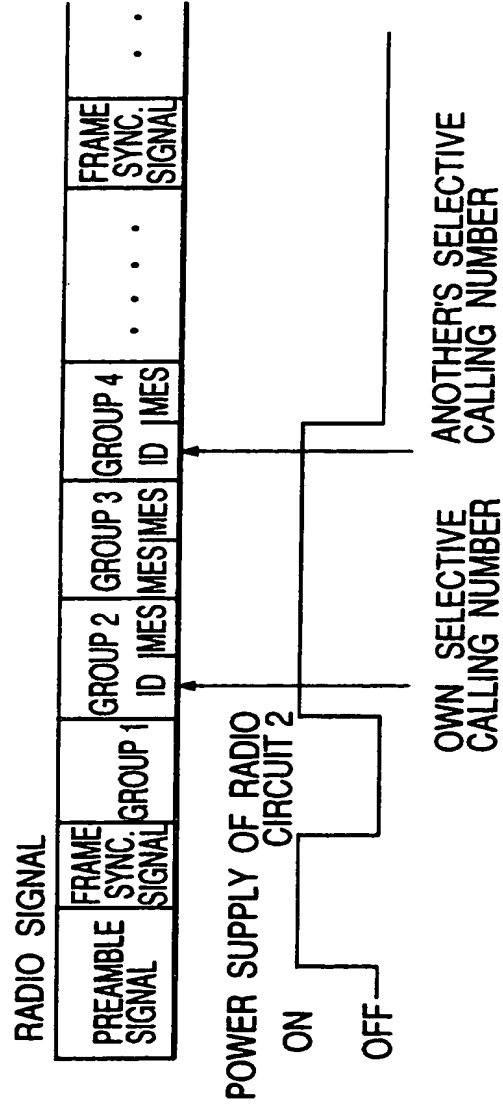


FIG. 3(b)

PREDETERMINED CODE NOS.	PREDETERMINED MESSAGES	CALL NOTIFICATION CONTENTS
01	I WILL BE LATE	RINGING TONE 1
02	I WILL LEAVE EARLY	RINGING TONE 2
03	WHERE ARE YOU ?	RINGING TONE 3
· · ·	· · ·	· · ·
31	MATTER OF URGENCY	
32	CALL ME SOON	MELODY 1
33	FAX ME SOON	MELODY 2
· · ·	· · ·	· · ·
99	GATHER AROUND	VIBRATION- DRIVE
00	CALL ME LATER	ONLY LED

FIG. 4

	MESSAGES CONTAINED ON RADIO SIGNAL	DISPLAYED MESSAGES	CALL INFORMATION CONTENTS
CASE 1	[[01[[33012-345-6789	I WILL BE LATE FAX ME SOON 012-345-6789	RINGING TONE 1
CASE 2	[[32098-765-4321[[31	CALL ME SOON 098-765-4321 MATTER OF URGENCY	MELODY 1
CASE 3	17:00[[99	17:00 GATHER AROUND	VIBRATION DRIVE

FIG. 5

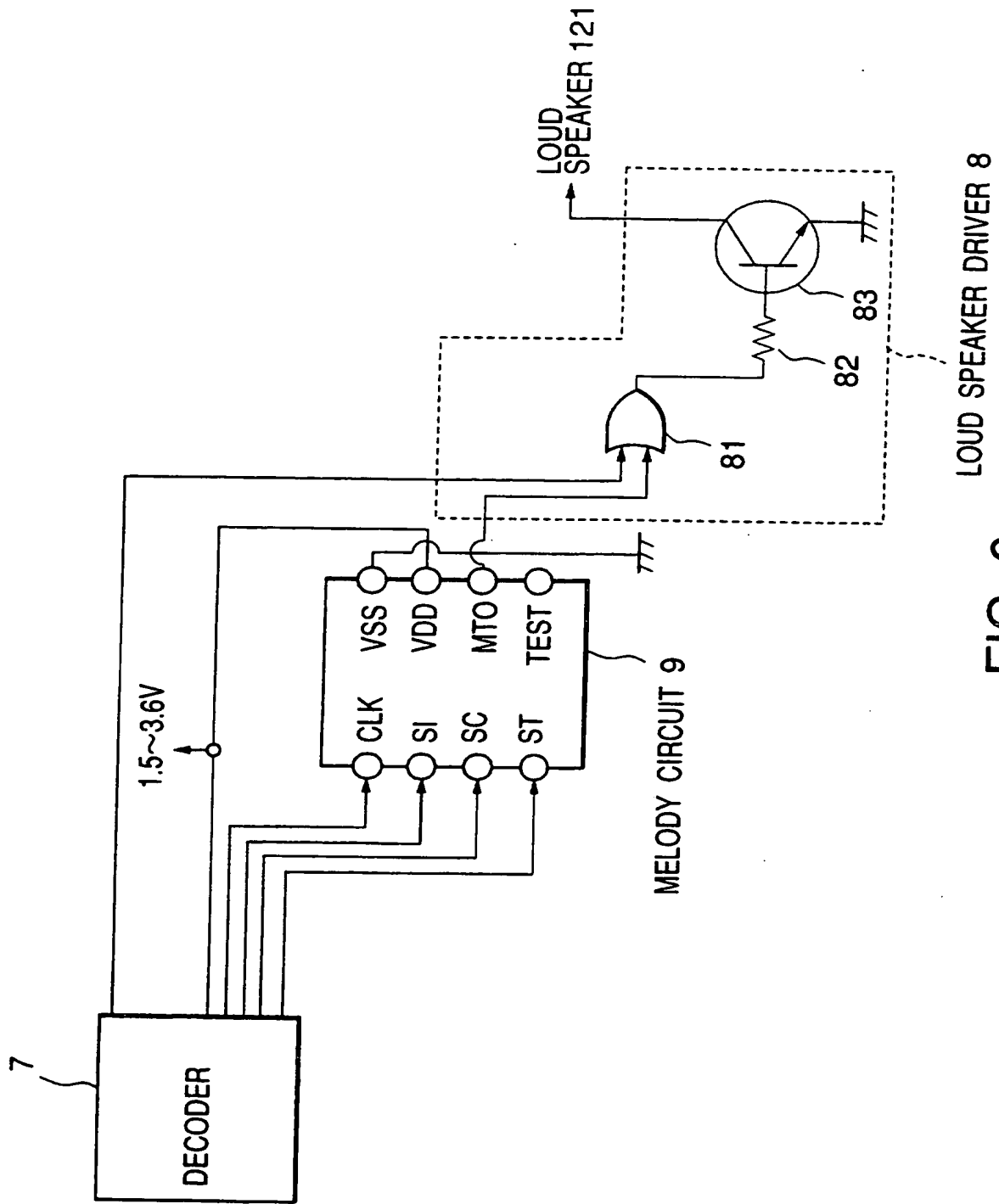


FIG. 6



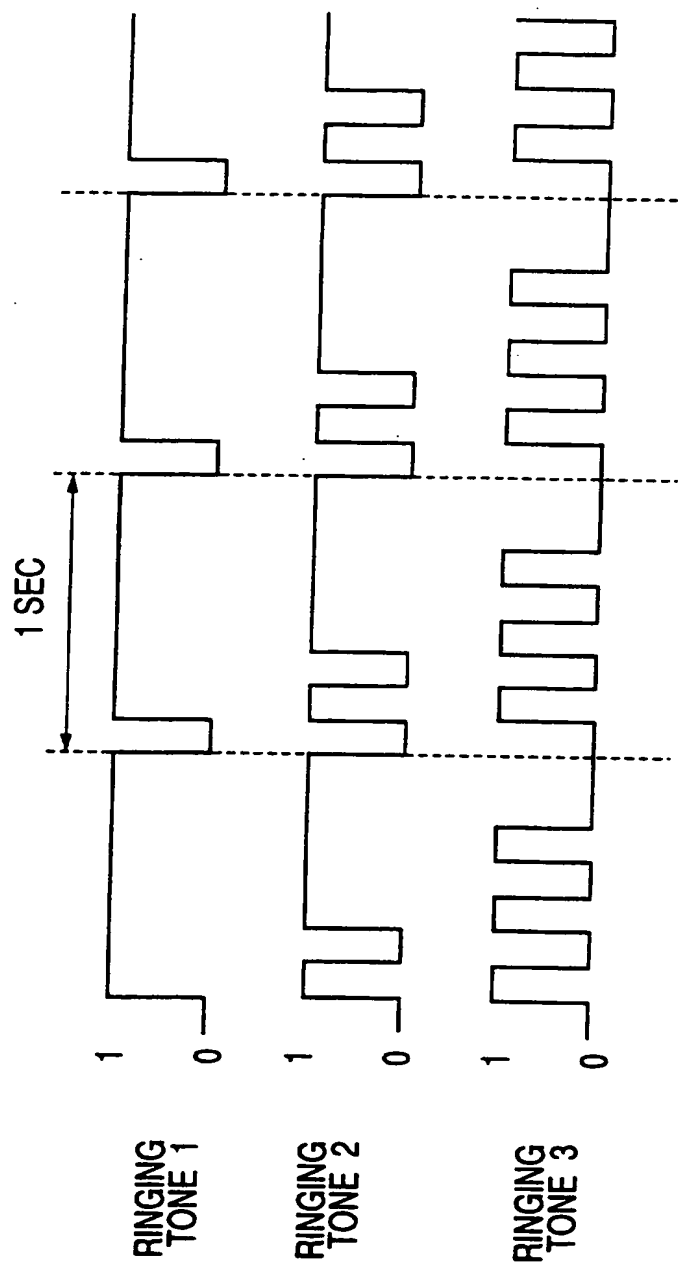


FIG. 7

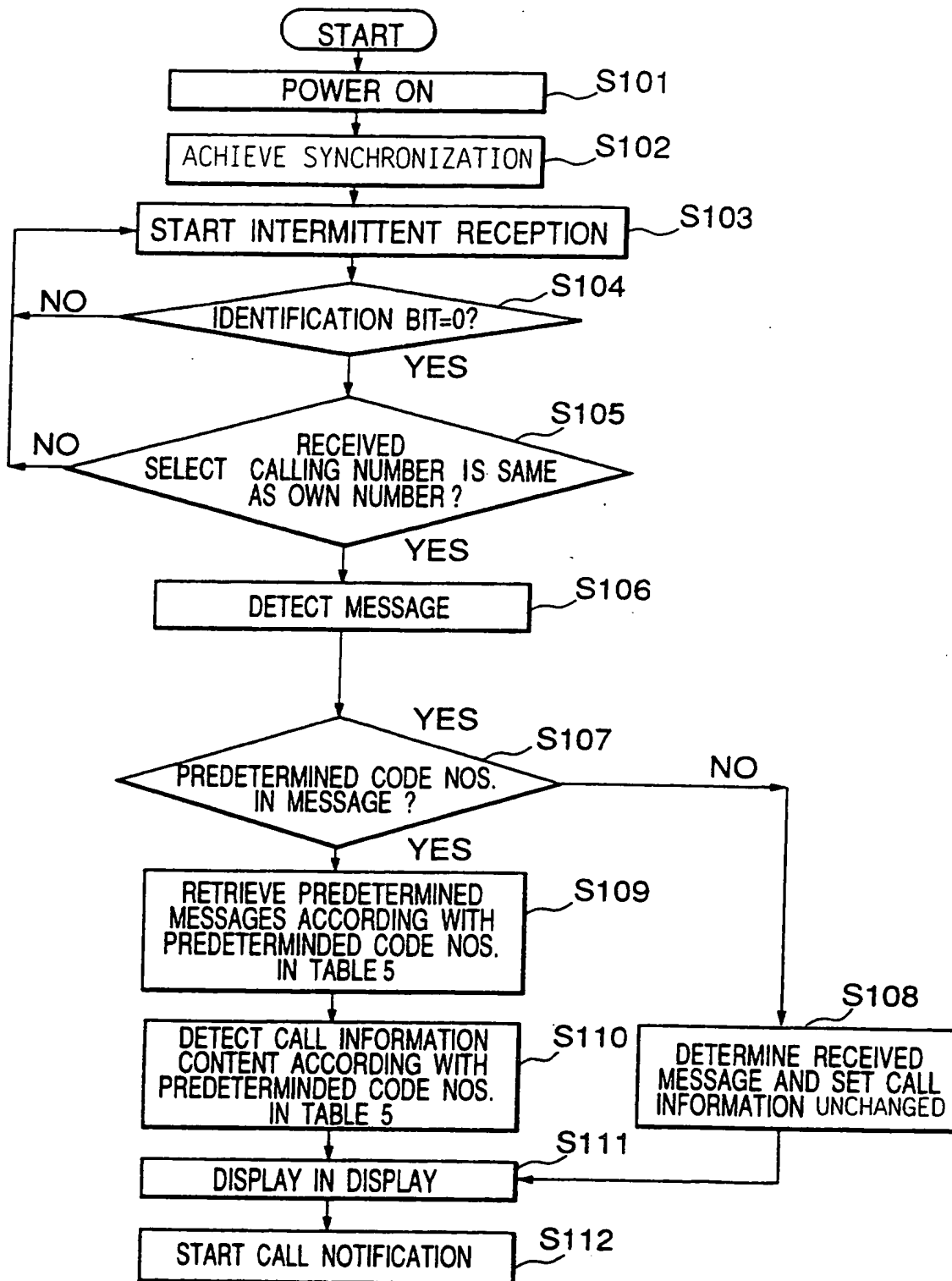


FIG. 8

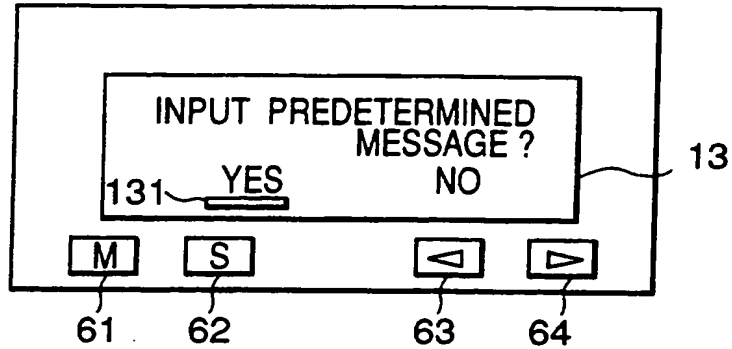


FIG. 9(a)

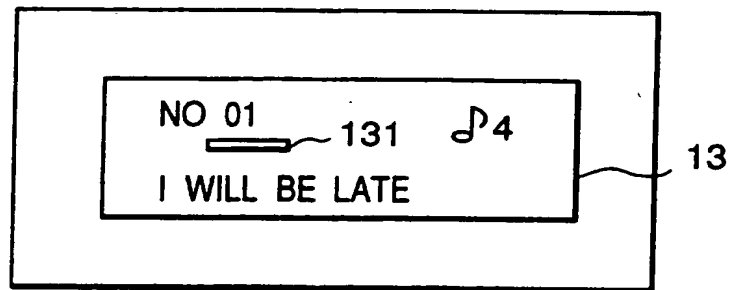


FIG. 9(b)

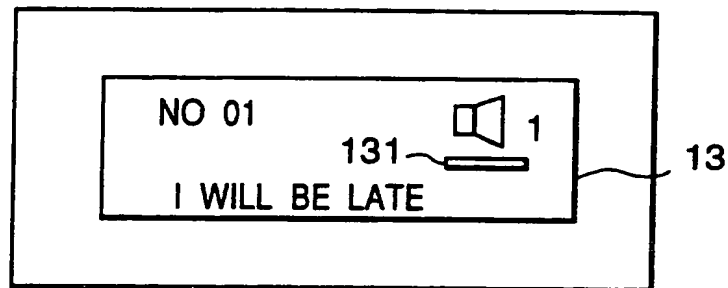


FIG. 9(c)

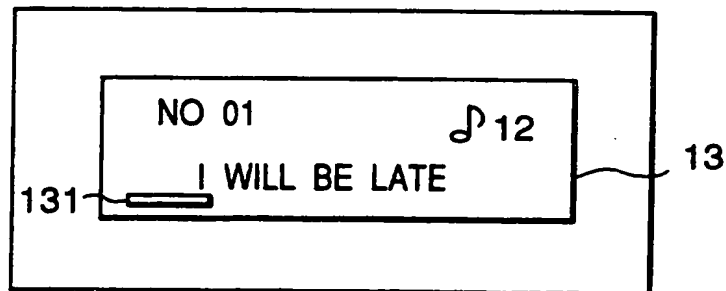


FIG. 9(d)

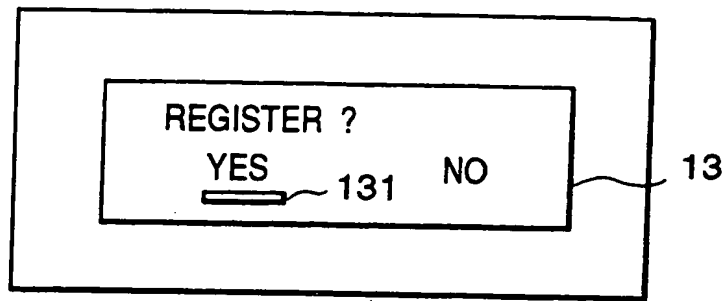


FIG. 9(e)

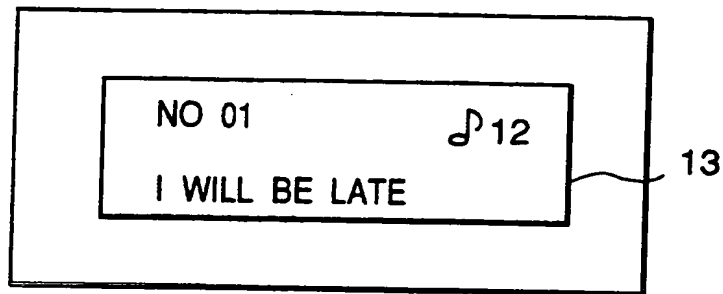


FIG. 9(f)

RADIO RECEIVER

## BACKGROUND OF THE INVENTION

The present invention relates to a radio receiver, more particularly, to a selective calling receiver.

A known selective calling receiver (referred to as "receiver" hereinafter), receives a radio signal transmitted from a base station and detects predetermined code numbers (referred to as "Nos." hereinafter) accompanying a selective calling number. The receiver converts the predetermined code Nos. into predetermined messages for displaying the predetermined messages when the received selective calling number is the same as the receiver's own selective calling number.

An example of a receiver which converts the predetermined code Nos. into the predetermined message, is disclosed in Japanese Patent Application Laid-open No. H3-232327 of October 16, 1991.

That receiver fetches predetermined code Nos., which are two-digit numbers, from a received radio signal, and compares corresponding two-digit numbers stored therein. If the received two-digit numbers coincide with the stored ones, the receiver converts the coincident two-digit numbers into predetermined messages and display the messages.

Such a receiver is called a receiver having a "predetermined message service", and this kind of receiver has been recently provided, however, a bearer of the

receiver must see the display to recognize the messages. Thus, it is troublesome for him.

Japanese Patent Application Laid-open No. S63-252029 of October 29, 1983 discloses a receiver which changes the sounds of call notification in accordance with a series of call numbers stored in the receiver.

A bearer of this receiver may thus know who is calling him, even though he does not see a display. However he cannot recognize messages if he does not see the display. Surely, it is possible to inform messages of him without seeing the display, if the receiver has a lot of own selective calling number assigned to each of messages and call information is assigned to the each of selective calling number. However, the service from the provider managing transmission may results in reduction in a number of telephone lines, and hence the service for providing a plurality of call numbers does not currently spread.

Further, types of sound for informing an incoming call are only specified in accordance with an own selective calling numbers, and the bearer must therefore see the display for recognizing the received message in case of the receiver having only one selective calling number.

#### SUMMARY OF THE INVENTION

According to the invention in a first aspect there is provided a radio receiver comprising a receiving circuit for receiving a call signal for calling a user of the receiver, a storing circuit for storing at least a predetermined code,

a detecting circuit for detecting a code included in a message accompanying said call signal, a judgement circuit for judging whether the received code is coincident with the stored predetermined code; and a notification circuit for performing call notification according to coincident code.

According to the invention in a second aspect there is provided a selective calling receiver comprising a receiving circuit for receiving a selective calling number, an address memory for storing an own selective calling number, a message memory for storing at least one predetermined code, a first judgement circuit for judging whether a received selective calling number is the same as the stored own selective calling number, a detecting circuit for detecting a code included in a message accompanying said selective calling number when said first judgement circuit judges that the received selective calling number is the same as the stored own selective calling number, a second judgement circuit for judging whether the received code is the same as the stored predetermined code, and a notification circuit for performing call notification when the received code is the same as the stored predetermined code.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described in more detail by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a schematic block diagram of a selective calling receiver according to an embodiment of the present invention;

Fig. 2(a) shows a format of a radio signal received by the receiver shown in Fig. 1, and Fig. 2(b) shows a configuration of each code word shown in Fig. 2(a);

Figs. 3(a) and 3(b) are views explaining an intermittent receiving operation carried out by the receiver shown in Fig. 1, wherein Fig. 3(a) shows a non-receiving state where the receiver's own selective calling number is not received while Fig. 3(b) shows the state where the receiver's own selective calling number is received;

Fig. 4 shows an example of the database stored in the table shown in Fig. 1, which database stores predetermined code Numbers, predetermined messages and call notification contents;

Fig. 5 shows a relation between a received message, displayed message and call notification content;

Fig. 6 is a circuit diagram of an example of a melody circuit and a loudspeaker driver shown in Fig. 1;

Fig. 7 shows examples of a ringing tones generated by a loudspeaker shown in Fig. 1;

Fig. 8 is a flowchart showing the process effected by the receiver shown in Fig. 1; and

Figs. 9 shows an example of a method of setting the predetermined code numbers, predetermined messages and call notification contents in the receiver.



#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

In Fig.1, an antenna 1 receives a radio signal from a base station (not shown) and outputs a received signal to a radio circuit 2. The radio circuit 2 is controlled to be turned on and off by a control signal from a decoder 7, for battery conservation. The radio circuit 2 amplifies the received signal supplied from the antenna 1, demodulates it and supplies the demodulated signal to a wave-shaper circuit 3. The wave-shaper circuit 3 wave-shapes the demodulated signal to a digital signal and supplies the digital signal to the decoder 7.

An address memory 4 stores the receiver's own selective calling number and outputs it to the decoder 7. A table 5 stores predetermined code Nos., predetermined messages and call notification data, each of which relates to a corresponding one of the predetermined code Nos. The decoder 7 detects a preamble signal and a frame sync. signal from the digital signal by decoding, to achieve synchronization of the receiver with the base station, and outputs the control signal to the radio circuit 2 based on the achieved synchronization. The decoder 7 detects a selective calling number from the digital signal by decoding and judges whether the detected selective calling number is the same as the receiver's own selective calling number supplied from the address memory 4. The decoder 7 also detects predetermined code Nos. accompanying the selective calling number by decoding, if the selective calling number coincides. After detecting the predetermined code Nos. the decoder 7 compares received predetermined code Nos. to stored predetermined code Nos. and if

some of the received codes coincide with one of the stored code, outputs a coincidence signal to a loudspeaker driver 8 and/or a melody circuit 9 and/or a vibrator driver 7 and/or a LED driver 11 based on the call information contents stored in the table 5. Further the decoder 7 outputs to a display driver 12 the predetermined messages assigned to the stored code Nos. which coincide with the received predetermined code Nos.

The display driver 12 drives a display 13, thus the display 13 displays the predetermined messages outputted from the decoder 7. The loudspeaker driver 8, the melody circuit 9, the vibrator driver 10 and LED driver 11 are controlled by the coincidence signals from the decoder 7. A call notification circuit 12 includes a loudspeaker 121, a vibrator 122 and a LED 123, and these are driven by respective drivers and melody circuit 8, 9, 10 and 11. Thus, circuit 12 performs call notification according to the received messages.

Switches 6 are operated by the bearer for selecting the manner of call notification.

In Fig. 2(a), a radio signal transmitted from a base station is constituted by a 576-bit preamble signal and a 32-bit frame sync. signal following the preamble signal. The preamble signal and the sync. signal are used for achieving synchronization of the receiver with the base station.

The receiver belongs to one of several groups, and its own selective call number is transmitted only in a time assigned to the group that the receiver belongs to. After turning on the power supply and receiving the preamble signal and the sync.

signal for achieving synchronization, the receiver may therefore perform reception only in a time assigned to the group that the receiver belongs to. The intermittent receiving operation for performing reception only in the time assigned to the group that its own receiver belongs to will be described later with reference to Figs. 3.

A group 1 is transmitted to the receiver after the transmission of a frame sync. signal. In Fig. 2(a), a frame sync. signal and eight groups makes up one batch, and one group consists of two code words.

After one batch is transmitted, another batch is transmitted to the receiver.

Each code word is constituted as shown in Fig. 2(b). That is, the code word consists of 32 bits in total and is made up of a selective calling number/message identification bit (simply referred to as "identification bit" hereinbelow), information bits, check bits and a parity bit in the mentioned order.

The identification bit is one bit and is used for judging whether the code word represents a selective calling number or represents the message, with the code word representing the selective calling number when the bit is 0 while the same representing the message when the bit is 1.

The information portion consists of 20 bits, and a selective calling number is recorded in the information portion when the identification bit is 0, whereas the message is recorded in the information portion when the identification bit is 1.

The check bits consist of 10 bits and the parity bit consists of one bit, namely a transmission error is corrected by using a (31, 20) + 1BCH signal.

In Fig. 3, Fig. 3(a) shows the case of reception where the receiver's own selective calling number is not received, whereas Fig. 3(b) shows the case of reception where the receiver's own selective calling number is received.

When the power supply of the receiver is turned on, reception continues until the preamble and sync signals are received, and synchronization with the base station is attained.

As described above, the receiver's own selective calling number is previously stored in the address memory 4 of the receiver, and the group that the receiver belongs to is also stored in the same. Fig. 3(a) and Fig. 3(b) are views showing the case where the receiver belongs to the group 2, in which the power supply of the radio circuit 2 is turned off while no selective calling number is transmitted to the receiver belonging to the group 2 after the preamble signal and the sync. signal are received and synchronization with the base station achieved, in order to perform the intermittent receiving operation. By doing so, power consumption of the receiver can be reduced.

As shown in Fig. 3(a), when the receiver's own selective calling number has not been received, the power supply of the radio circuit 2 is turned on only when the selective calling number relative to the receiver belonging to the group 2 is transmitted.

Meanwhile, Fig. 3(b) shows the receiving state where the receiver's own selective calling number is received. That is, when the identification bit is 0 and the receiver's own selective calling number matches the information portion in the code word of the group 2, reception is continued until a code word having the identification bit of 0 is subsequently transmitted, because the message may be possibly transmitted to the receiver when the selective calling number relative to the receiver belonging to any other group following the group 2 is transmitted.

In Fig. 3(b), a symbol ID represents a code word having the identification bit of 0, i.e., the selective calling number, and a symbol MES represents a code word having the identification bit of 1, i.e., the message. In case of Fig. 3(b), since the receiver's own selective calling number matches the first code word of the group 2 and the identification bit is thereafter turned to 0 for the first time with the first code word of the group 4, reception occurs from the first code word of group 2 through the first code word of group 4.

The message intended for the receiver is set in the second code word of the group 2 through the second code word of group 3, and the receiver detects a predetermined code Nos. from this message.

In Fig. 4, predetermined code Nos., predetermined messages and call notification data are stored in the table 5 of the receiver. The predetermined code Nos. consists of two-digit figures. The predetermined messages are assigned to each of the

predetermined code Nos. For example, if the receiver receives the predetermined code No. "01", the receiver converts code "01" into the predetermined message " I WILL BE LATE", and in the same way, predetermined code No. "02" is converted into the predetermined message "I WILL LEAVE EARLY". The predetermined code Nos. are also assigned to each of call notification codes. For example, if the receiver receives the predetermined code No. "01", the loudspeaker 12 of the receiver generates ringing tone 1, and in the same way, when predetermined code No. "31" is received, the loudspeaker 12 generates melody 1.

In Fig. 5, case 1 is when the receiver receives message "[[01[[33012-345-6789". At that time the receiver detects predetermined code Nos. by searching the identification code "[[ ". The identification code "[[" indicates that the following two-digit figure is a predetermined code No. Thus, the receiver detects the predetermined code No. "01" and converts it into the predetermined message "I WILL BE LATE". In the same way, the receiver detects the predetermined code No. "33" accompanying the identification code "[[" and converts it into the predetermined message "FAX ME SOON". The message "012-345-6789" following the predetermined code No. "33" is not converted into a predetermined message and is displayed without changes, since no identification code precedes the front bits of the message "012-345-6789". As described above, the displayed message becomes "I WILL BE LATE FAX ME SOON 012-345-6789". At that time, the loudspeaker 12 generates the ringing tone 1, since the receiver performs the

call notification assigned to the predetermined code No, which is detected by the decoder 7 first.

In Fig. 6, the melody circuit 9 consists of the integrated circuit "SM1124ABS-ET". The melody circuit 9 has eight terminals, CLK, SI, SC, ST, VSS, VDD, MTO and TEST terminals, and the decoder 7 has six output terminals. The power supply 1.5-3.6V is supplied to the VDD terminal and the terminal VSS is grounded. The terminal MTO is connected to a terminal of OR circuit 81 of the loudspeaker driver 8.

The loudspeaker driver 8 consists of the OR circuit 81, a register 82 and a transistor 83. The other terminal of the OR circuit 81 is connected to the decoder 7. The OR circuit 81 selects either a ringing tone from the decoder 7 or a melody from the melody circuit 9 and outputs one of them as an OR signal to a base terminal of the transistor 81 through the register 82. The transistor 81 is biased by a voltage of the register 82 and current-amplifies the OR signal. The amplified OR signal is supplied to the loud speaker 121 and drives the circuit 121.

In Fig. 7, control is performed in such a manner that ringing tones 1, 2 and 3 are output only during a signal level of 1 and output of these tones is stopped during a signal level of 0. This allows the type of ringing to be changed.

In Fig. 8. when the power supply of the receiver is turned on (STEP S101), the receiver receives and detects the preamble signal and the sync. signal for achievement of synchronization with a base station (S102). Then, the

intermittent receiving operation shown in Fig. 3(a) is started (S103).

If the identification bit which is a first bit in the code word is 0 when the power supply of the receiver is turned on in step (S104), the process advances to the next step (S105), and when the selective calling number in the radio signal coincides with the receiver's own selective calling number, the message associated with the coincident selective calling number is detected (S106). If the identification bit is not 0 or if the selective calling number in the radio signal does not coincide with the receiver's own selective calling number, the process returns to step (S103) to continue the intermittent receiving operation.

After the message is detected in accordance with each code word, the decoder 7 judges whether predetermined code Nos. are included in the detected message (S107). If the predetermined code Nos. are not included, the process goes to step S108. On the other hand, if predetermined code Nos. are included, these code Nos. are converted into predetermined messages (S109). After that, call notification data assigned to the predetermined code Nos. are also retrieved (S110).

If the result of judgment is NO in step (S117), the receiver determines that the detected message need not be converted into predetermined messages, displays it unchanged and also performs call notification in a manner selected by the bearer in advance (S108).



Thereafter, the receiver displays the messages, which are retrieved in STEP S109 and/or recognized in STEP S108, in display 13 (S111), and performs call notification by the content retrieved in STEP S110 and/or determined by STEP S108.

In Fig. 9(a), the user-operated switches 6 include a memory switch 61, a shift switch 62, a review switch 63 and a preview switch 64 (these switches are not shown in Figs. 9(b)-9(f) for the sake of clarity). In this Figure, if the receiver is placed in "predetermined messages and call notification select mode" (referred to as "select mode" hereinafter) by predetermined operation of switches 6, the display 13 displays "INPUT PREDETERMINED MESSAGE". An underscore 131 moves below positions of "YES" and "NO" by pushing the switches 63 and 64. If the bearer wants to set or change the predetermined messages and/or the call notification technique, he pushes the switch 62 when the underscore 131 is below the position of "YES"

Fig. 9(b) shows display 13 after the operation of the switch 62. The underscore 131 is in a position of "01" which shows a number of a predetermined code Nos. The bearer operates the switches 63 and 64 for switching the number of a predetermined code Nos. and when the switch 62 is pushed, a predetermined code No. is selected. The display is changed as shown in Fig. 9(c) after operation of the switch 62, and the underscore 131 is moved to a position below the call notification type. The call notification type is switched by operation of switches 63 and 64 and the switch 62 is pushed to select a desired call notification type.

As shown in Fig.9 (d), the bearer next decides the predetermined messages after selecting the call notification type. He enters a predetermined message by moving the underscore 131, and also by pushing the switches 63 and 64. When the message is entered, the switch 64 is operated and the display goes to the next stage shown in Fig. 9(e). In Fig. 9(e), he confirms whether the selected predetermined code No, call notification type and predetermined message are correctly entered, and if they should be registered, he pushes the switch 61 when the underscore 131 is in a position below "YES". And finally, display 13 displays the registered code, notification type and message as shown in Fig. 9(f).

Although in this embodiment, predetermined messages are displayed in the display 13, it is however possible only to perform the call notification assigned to a received predetermined code Nos. without displaying the message. In order to achieve this, the predetermined messages to be displayed is not registered and only the call notification type is stored in the table 5 when the bearer sets a predetermined message, and control is effected in such a manner that nothing is displayed in the display 13 if the predetermined code Nos. assigned to the stored predetermined message is included in the received signal, thereby effecting only the call notification without displaying anything in the display 13.

Further, although in this embodiment the signal format of the radio signal to be received by the receiver has been described as that of the POCSAG signal, the present system can

applied to other signal formats such as the NTT system signal, the ERMES signal or any kind of signal which is capable of transmitting the predetermined code Nos.

Further, the present system may be applied to a signal which is not capable of transmitting the predetermined code Nos. In order to achieve that, the receiver stores a predetermined message, for example the name of a person who might call the bearer, and when the receiver detects the stored name in a received radio signal, the call notification circuit performs call notification according to the stored name.

Furthermore, in this embodiment, the present invention is described as a selective calling receiver; however, the present invention is not limited to use in selective calling receivers but is also applicable to a general radio receiver, for example a personal radio phone or automobile phone.

As mentioned above, according to the present system, since the bearer can specify the manner of call notification based on the predetermined message, the predetermined message can be readily recognized without seeing the display.

Numerous additional modifications and variations of the present invention are possible in light of the above teachings. It is therefore, to be understood that within the scope of the appended claims, the present invention may be practiced otherwise than as specifically described herein.

## CLAIMS

1.       A radio receiver comprising:
  - a receiving circuit for receiving a call signal for calling a user of the receiver;
  - a storing circuit for storing at least one predetermined code;
  - a detecting circuit for detecting a code included in a message accompanying said call signal;
  - a judgement circuit for judging whether the received code is coincident with the stored predetermined code; and
  - a notification circuit for performing call notification in accordance with the coincident code.
2.       The receiver claimed in claim 1, wherein said notification circuit comprises;
  - a loudspeaker for generating sound,
  - a vibration generating mechanism, and
  - an LED for providing intermittent illumination,
  - and wherein said notification circuit generates at least one of sound, vibration and illumination when said received code is the same as said predetermined code.
3.       The receiver claimed in claim 2, wherein said loudspeaker generates either a ringing tone or a melody.
4.       The receiver claimed in claim 1, further comprising a setting circuit, operated by the user of said receiver, for

setting said predetermined code and call notification data assigned to said predetermined code.

5.           A selective calling receiver comprising:
- a receiving circuit for receiving a selective calling number;
  - an address memory for storing an own selective calling number;
  - a message memory for storing at least one predetermined code;
  - a first judgement circuit for judging whether a received selective calling number is the same as the stored own selective calling number;
  - a detecting circuit for detecting a code included in a message accompanying said selective calling number when said first judgement circuit judges that the received selective calling number is the same as the stored own selective calling number;
  - a second judgement circuit for judging whether the received code is the same as the stored predetermined code; and
  - a notification circuit for performing call notification when the received code is the same as the stored predetermined code.

6.           The selective calling receiver claimed in claim 5, wherein said notification circuit comprises;
- a loudspeaker for generating sound,
  - vibrating generating mechanism, and

LED for providing intermittent illumination,  
and wherein said notification circuit generates at least one of sound, vibration and illumination when said received code is the same as said predetermined code.

7. The selective calling receiver claimed in claim 8, wherein said loudspeaker generates either a ringing tone or a melody.

8. The selective calling receiver claimed in claim 6 further comprises setting circuit, operated by a bearer of the selective calling receiver, for setting said stored code and call information assigned to said stored code.

9. The selective calling receiver claimed in claim 6, wherein said message memory further stores predetermined message assigned to said stored code, and the selective calling receiver further comprises display for displaying the message assigned to the detected code.

10. The selective calling receiver claimed in claim 8, wherein said setting circuit for further setting said predetermined message assigned to the stored code.

11. A selective calling receiver substantially as herein described with reference to the drawings.



Application No: GB 9712390.5  
Claims searched: 1-11

Examiner: Mike Davis  
Date of search: 30 July 1997

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): G4H (HRCU)

Int Cl (Ed.6): G08B

Other:

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	EP 0265064 A2 (NEC)	1 at least
X	WO 94/18760 A1 (TOSHIBA)	1,5 at least
X	WO 90/09082 A1 (MOTOROLA)	"
X	WO 88/05247 A1 (MOTOROLA) e.g. page 20 lines 20-24	"
X	US 4419668 (GANUCHEAU)	"

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.